FRQ Friday – 4/16

AP Biology Insta-Review @apbiopenguins

2013 #3

2015 #2

FRQ 2013 #3

AP Biology Insta-Review @apbiopenguins

Fossils of lobe-finned fishes, which are ancestors of amphibians, are found in rocks that are at least 380 million years old. Fossils of the oldest amphibian-like vertebrate animals with true legs and lungs are found in rocks that are approximately 363 million years old.

Three samples of rocks are available that might contain fossils of a transitional species between lobe-finned fishes and amphibians: one rock sample that is 350 million years old, one that is 370 million years old, and one that is 390 million years old.

(a) **Select** the most appropriate sample of rocks in which to search for a transitional species between lobe-finned fishes and amphibians. **Justify** your selection.

- Selection: Rocks from 370 MYA sample.
- Justification: Transitional fossils are found between 380 MYA (when lobe-finned fishes lived) and 363 MYA (when amphibians appeared) OR between different strata/layers in the correct order.

FRQ 2013 #3

AP Biology Insta-Review @apbiopenguins

(b) **Describe** TWO pieces of evidence provided by fossils of a transitional species that would support a hypothesis that amphibians evolved from lobe-finned fishes.

- Bones OR specific skeletal structures
  - legs /limbs/digits
  - vertebrae
  - flat skulls
  - (interlocking) ribs
  - flexible neck
- Scales
- Teeth
- Other homologous structures

- Has traits of both the lobe-finned fish and the amphibian
- Finding the transitional fossils in the same area/same environment as either the lobe-finned fish or the amphibian
- Molecular (DNA) evidence

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

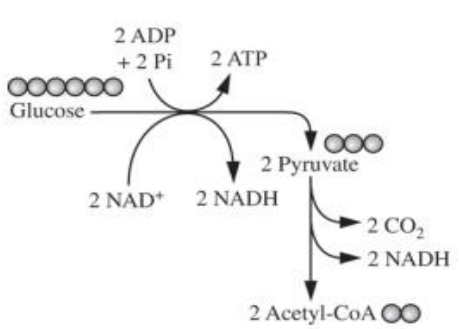


Figure 1. Glycolysis and pyruvate oxidation

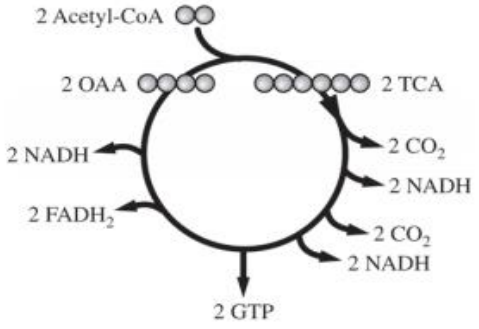


Figure 2. Krebs cycle

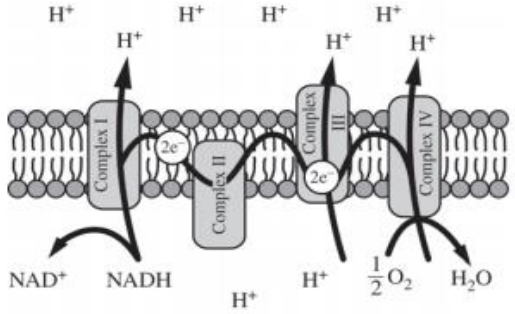


Figure 3. Electron transport chain

Cellular respiration includes the metabolic pathways of glycolysis, the Krebs cycle, and the electron transport chain, as represented in the figures. In cellular respiration, carbohydrates and other metabolites are oxidized, and the resulting energy-transfer reactions support the synthesis of ATP.

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(a) Using the information above, **describe** ONE contribution of <u>each</u> of the following in ATP synthesis.

- Catabolism of glucose in glycolysis and pyruvate oxidation

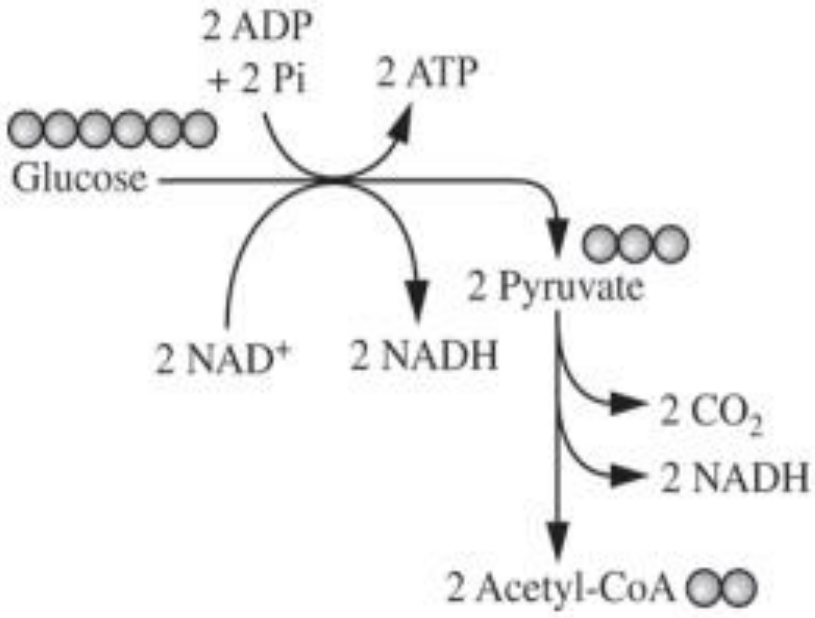


Figure 1. Glycolysis and pyruvate oxidation

Description **(1 point each box; 3 points maximum)**
• Produces NADH for use in ETC • Produces acetyl-CoA for entry into Krebs cycle • Provides energy for (substrate level) phosphorylation of ADP

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(a) Using the information above, **describe** ONE contribution of <u>each</u> of the following in ATP synthesis.

- Oxidation of intermediates in the Krebs cycle

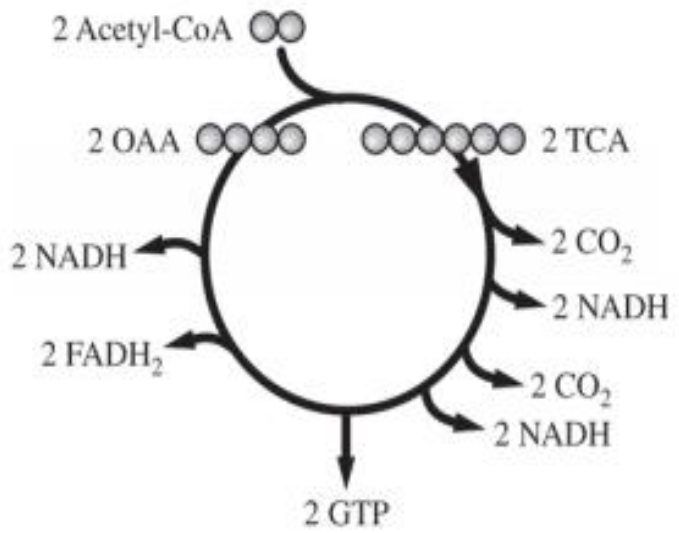


Figure 2. Krebs cycle

Description **(1 point each box; 3 points maximum)**
• Produces NADH or FADH2 for use in ETC • Releases high energy electrons for use in ETC • Provides energy to pump protons against their concentration gradient • Produces GTP for (substrate level) phosphorylation of ADP

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(a) Using the information above, **describe** ONE contribution of <u>each</u> of the following in ATP synthesis.

- Formation of a proton gradient by the electron transport chain

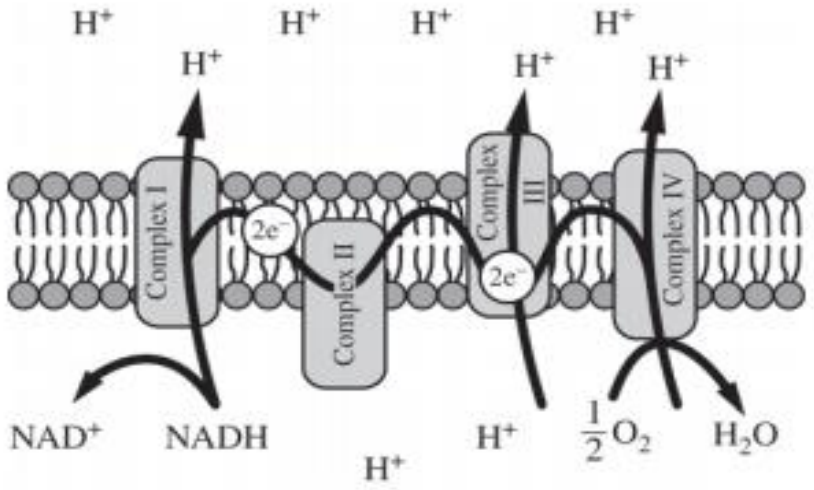


Figure 3. Electron transport chain

Description **(1 point each box; 3 points maximum)**
• The flow of protons through membrane-bound ATP synthase generates ATP • Provides energy for (oxidative) phosphorylation of ADP

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(b) Use each of the following observations to **justify** the claim that glycolysis first occurred in a common ancestor of all living organisms.

- Nearly all existing organisms perform glycolysis.
- Glycolysis occurs under anaerobic conditions.
- Glycolysis occurs only in the cytosol.

Observation	**Justification (1 point each box; 3 points maximum)**
Nearly all existing organisms perform glycolysis	• Trait/gene/process originated early and was inherited/passed down/highly conserved • Glycolysis provided a selective advantage that was passed on to descendants
Glycolysis occurs under anaerobic conditions	Origin of glycolysis pre-dates free atmospheric oxygen/photosynthesis
Glycolysis occurs only in the cytosol	Origin of glycolysis pre-dates cell types with membrane-bound organelles/eukaryotes/endosymbiosis

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(c) A researcher estimates that, in a certain organism, the complete metabolism of glucose produces 30 molecules of ATP for each molecule of glucose. The energy released from the total oxidation of glucose under standard conditions is 686 kcal/mol. The energy released from the hydrolysis of ATP to ADP and inorganic phosphate under standard conditions is 7.3 kcal/mol. **Calculate** the amount of energy available from the hydrolysis of 30 moles of ATP. **Calculate** the efficiency of total ATP production from 1 mole of glucose in the organism. **Describe** what happens to the excess energy that is released from the metabolism of glucose.

30 moles produced x 7.3 kcal/mole = 219 kcal
Glucose has 686 kcal/mol
Efficiency = 219 kcal/686 kcal = 0.319

31% or 32%

The excess energy is released as heat.

FRQ 2015 #2

AP Biology Insta-Review @apbiopenguins

(d) The enzymes of the Krebs cycle function in the cytosol of bacteria, but among eukaryotes the enzymes function mostly in the mitochondria. **Pose** a scientific question that connects the subcellular location of the enzymes in the Krebs cycle to the evolution of eukaryotes.

Question (1 point)

- A valid scientific question related to evolution of eukaryotes (e.g., Since the Krebs cycle occurs in the "cytoplasm" of the mitochondria (matrix), does it suggest that mitochondria were once prokaryotes?)

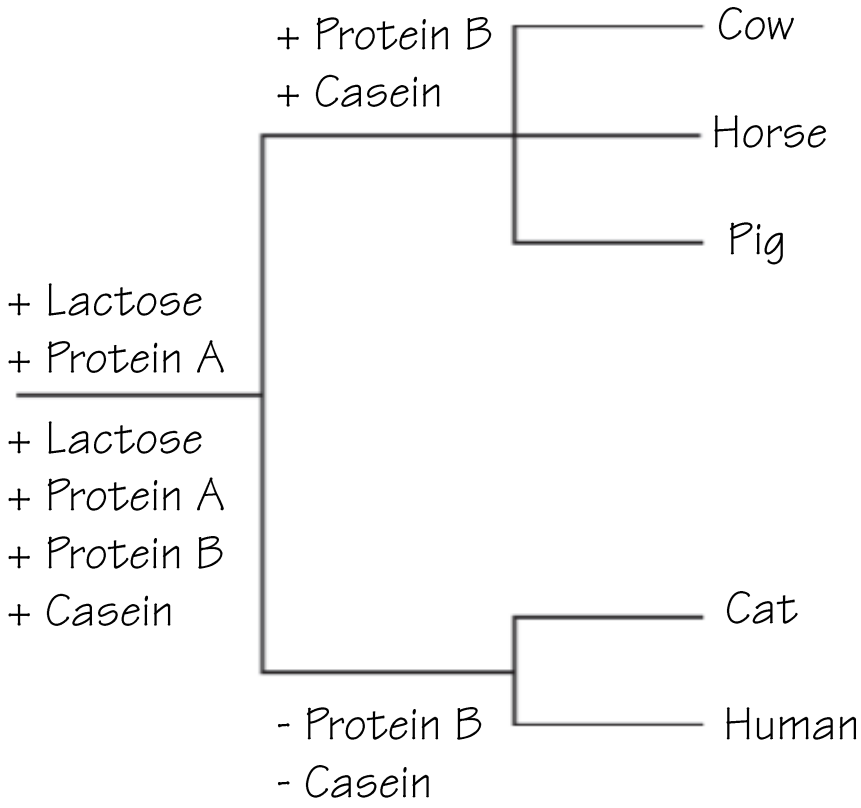
BONUS - FRQ 2014 #2

AP Biology Insta-Review @apbiopenguins

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character



Next FRQ Friday (4/23)

AP Biology Insta-Review @apbiopenguins

2018 #3

2018 #7

2016 #5

Download your 2021 AP Exam app

AP Biology Insta-Review @apbiopenguins

cb.org/ap2021examapp